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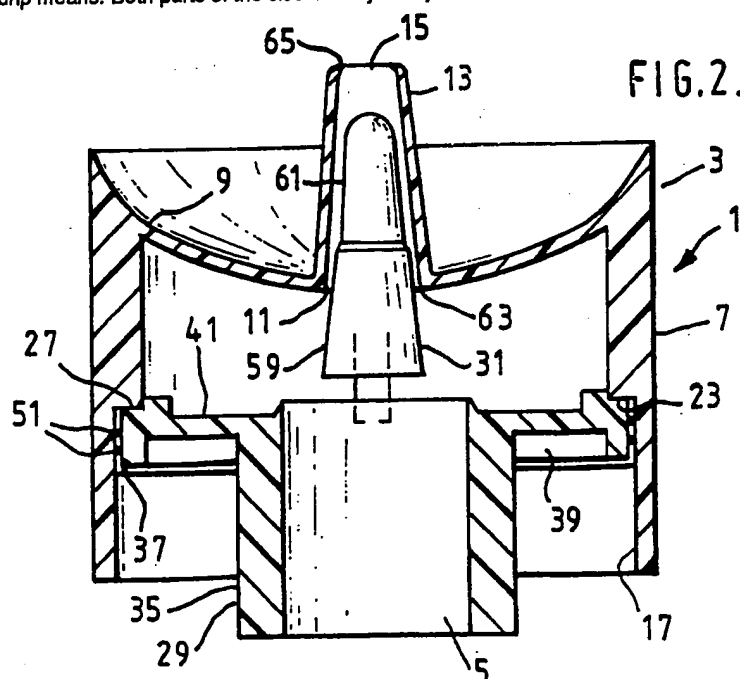
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U1S S1427

(56) Documents cited  
GB 2038788 A GB 1583494 A WO 82/00128 A1  
US 4699300 A

(58) Field of search  
UK CL (Edition K) B8T TWG  
INT CL<sup>6</sup> B65D 47/04 47/06

## (54) Valved closure

(57) A dispensing closure 1 for a container eg a squeeze bottle, comprises a flexible diaphragm 9 having an opening 11 leading into a contiguous nozzle 13, and a pillar 31 arranged to cooperate with the nozzle such that pressure applied to contents in the container causes the diaphragm to flex to move the nozzle out of contact with the pillar. This movement allows contents of the container, eg liquid detergent, to exit through the nozzle. Preferably the diaphragm is provided on an outer part 7, which has a skirt 17 engaging with the container, and the pillar is provided on an inner part 5. The two parts are connected together by mutual interference fit, eg splines 25, 27, or by a screw thread. The pillar preferably comprises two tapered parts 59, 61 and may have a longitudinal notch to aid venting. The closure may be kept sealed during transit by providing either a lock down mechanism or a seal across the container neck and a piercing means on the closure. A tamper evident crimped ring seal may be provided around the closure circumference. An inwardly pointed rim 65 of the nozzle may act as an anti-drip means. Both parts of the closure may be injection moulded using a polymer.



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1990.

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FIG.1.

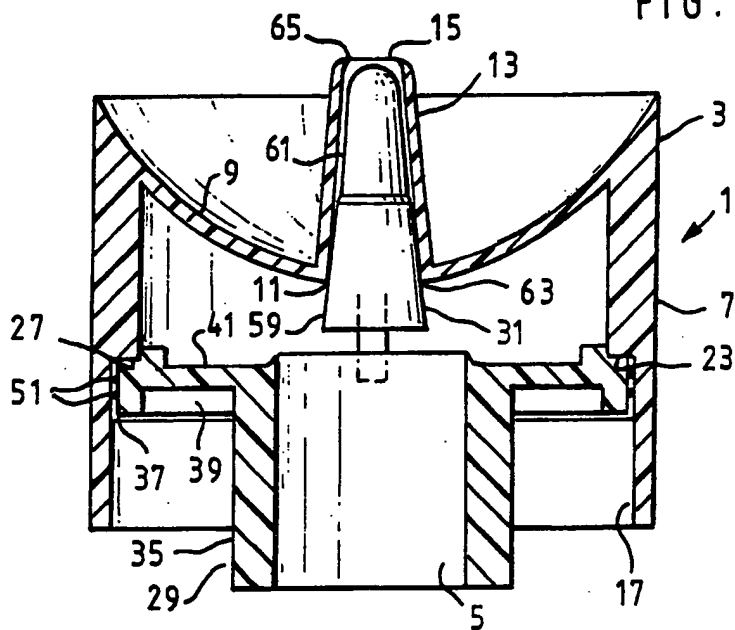
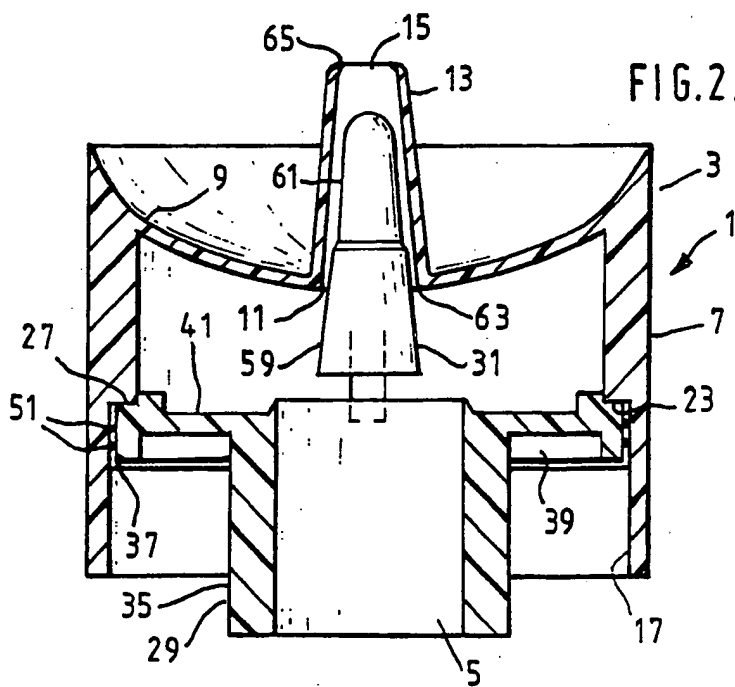


FIG.2.



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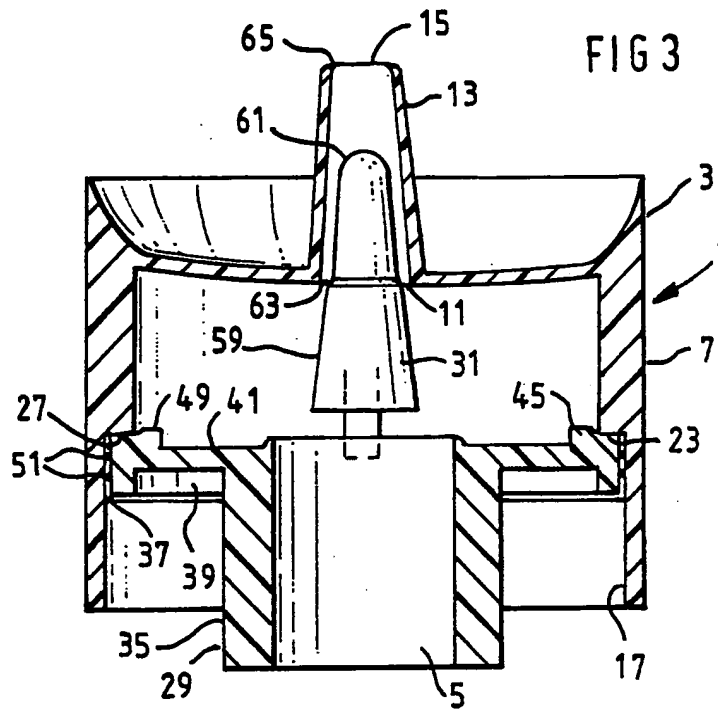
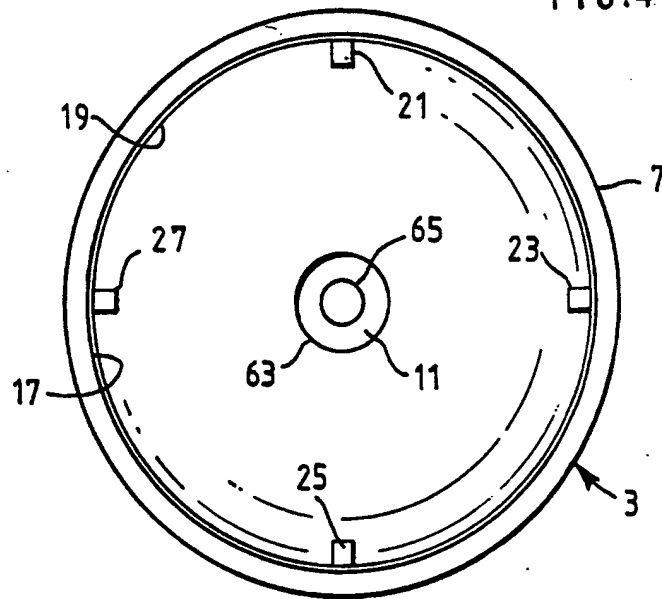


FIG.4.



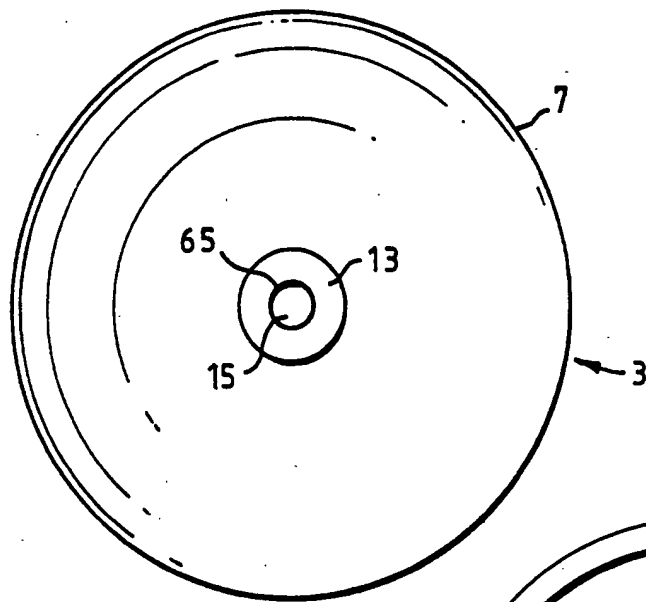


FIG. 5.

FIG. 6.

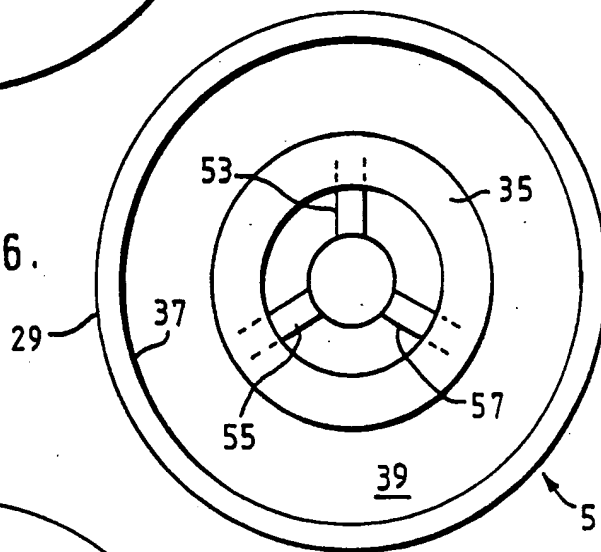
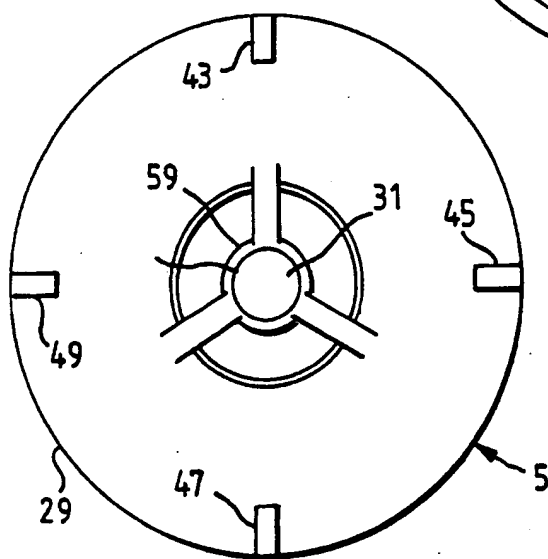


FIG. 7.



CLOSURE

The present invention relates to a closure for a container, particularly although not exclusively for a container of the kind where its contents are extracted by application of pressure. Such containers are usually squeezable or comprise a pump mechanism. Their contents are usually liquids, gels or pastes.

There have been several previous proposals for closures which do not have to be manually unscrewed or opened before use. Instead, they function as valves; when not in use they prevent leakage or escape of the contents but when, for example, the container is squeezed the resultant pressure forces them to open.

The majority of these known designs employ a sealing member which is spring biased into a closed position when not in use. The spring bias means may comprise a separate coil spring or a spring member formed integrally with the closure. Examples of these designs are disclosed in the following patent specifications: GB 1 175 249; DE 2 715 787; DE 2 703 095; and FR 2 032 744.

A variant of the latter type of construction is disclosed in UK Patent Specification GB 1 573 587. This device is based on the so-called Belleville spring washer. It comprises a conically or convexly contoured diaphragm having a central collar slidably disposed over a nozzle. When the container is squeezed, the washer is forced into a substantially flat configuration and as a result, the collar uncovers a side opening in the nozzle to open an exit path. When the pressure is released, the diaphragm returns to its original shape, re-sealing

the container.

The reliability of the seal afforded by the latter known closure when in the closed position is entirely dependent on the tolerance of fit between the collar and nozzle. Moreover, the closure provides no real user control over the dispensing rate.

We have now devised new kind of closure which ensures a good seal in the closed position and facilitates user control over the dispensing rate. Preferred embodiments have other advantages which will be elaborated hereinbelow.

Thus, the present invention provides a dispensing closure for a container, the closure comprising a flexible diaphragm having an opening leading into a nozzle contiguous with the diaphragm, the closure further comprising a pillar arranged to cooperate with the nozzle such that pressure applied to contents in the container causes the diaphragm to flex to move the nozzle out of contact with the pillar thus allowing contents to exit through the nozzle.

The closures according to the present invention are especially suited to use with semi-viscous liquids such as liquid detergent products for hand dishwashing. Conventional closures used on squeeze-bottles containing such products are opened manually, which often results in undiluted product coming into contact with the skin of the user. Also, in such applications, closures according to the present invention enable the product to be dispensed as a directional jet.

Preferably, the pillar is tapered so that in the closed position, the lower rim defined between the lower end of

the nozzle and the diaphragm opening is urged down onto the tapered periphery to effect a seal. However, in the alternative, it is also possible for the pillar to be provided with a shoulder for said rim to bear down upon, to make the seal when in the closed position.

It is especially preferred that the nozzle should also be tapered. Any taper on the pillar and/or on the nozzle is such that the diameter reduces in an upward direction, ie away from the container in the direction in which product is to be dispensed.

Most preferably, the pillar comprises two parts, both tapered as described above but with the lower part generally having a wider diameter than the upper part.

In a preferred embodiment, the closure comprises an outer part provided with the diaphragm and nozzle and an inner part provided with the pillar. The outer and inner parts may be connected together, for example, by mutual interference fit, or by an appropriate screw-thread arrangement. The outer part is conveniently provided with means enabling attachment to a container such as a squeeze bottle.

The pillar may also be provided with a longitudinal notch or score to aid venting, ie ingress of air to displace liquid such as when hand pressure applied to an associated squeeze bottle is released.

The closure is optionally provided with a lock-down mechanism to keep it in the closed position during transit.

Another means of keeping the closure and container closed (sealed) for transit is to provide a foil seal

across the neck of the container and to provide the closure with means for piercing the foil before first use. This piercing may for example be effected by pushing down on the closure to enable an appropriate member to pierce the foil.

A tamper-evident crimped-ring seal of known type may also be provided around the circumference of the closure.

The closure, including the diaphragm, is conveniently injection moulded using any polymer or combination of polymers suited to the particular application in question. Such polymers include polypropylene (homo-polymer or co-polymer), low density polyethylene, linear-low density polyethylene (octene process or butene process) and high density polyethylene.

The present invention will now be explained in more detail by the following description of a preferred embodiment and with reference to the accompanying drawings, in which: -

Figure 1 shows a closure according to the present invention in axial cross-section, when in the closed position;

Figure 2 shows the closure of Figure 1 when in a first open position;

Figure 3 shows the closure of Figure 1 when in a second open position;

Figure 4 shows an underneath view of the outer part of the closure shown in Figure 1-3;

Figure 5 shows a top view of the outer part shown in Figure 4;



Figure 6 shows an underneath view of the inner part of the closure shown in Figures 1-3; and

Figure 7 shows a top view of the inner part shown in Figure 6.

Referring to Figures 1-3, a closure 1 comprises an outer part 3 and an inner part 5.

The outer part has a circumferential wall 7 on top of which is situated, a thin-wall flexible diaphragm with an approximately spherical profile when the closure is in the closed position (Fig. 1). An opening 11 in the diaphragm (shown closed-off in Fig. 1, open in Figs. 2, 3) leads into a nozzle 13 contiguous with the diaphragm. The end of the nozzle remote from the diaphragm is provided with an exit hole 15.

Four splines 21, 23, 25, 27 are located on the shoulder as anti-rotation devices/excessive movement limiters (Fig. 4). However, these could be replaced by an annular shoulder.

The inner part 5 comprises a body 29 and a pillar 31 which is attached to the body by three struts 53, 55, 57.

The body of the inner has an inner central wall 35 on the lower part thereof and an outer circumferential rim 37 on its upper part. The top of the body has an upper platform 41 provided with four upstanding anti-rotation dogs 43, 45, 47, 49 to cooperate with the four splines on the outer part. The outer circumferential rim is received in the recessed portion 17 of the outer part with the splines and dogs interlinking.

A seal 51 may be provided between the inner and outer parts. The inner and outer parts may be fixed in position by means of mutual interference fit or by an appropriate thread mechanism (not shown).

As mentioned above, the pillar is conveniently connected to the body by means of the three struts 53, 55, 57 (Fig. 6).

The operation of the closure when in use will now be described in more detail.

Referring to Figure 1, it will be seen that the pillar 31 comprises a first lower part 59 which tapers so as to reduce in diameter in an upwardly direction. The pillar further comprises a second upper part 61 of overall reduced diameter as compared with the first part but which also tapers to reduce in diameter in the upward direction but with a different slope to that of the first lower part. The rim 63 at the junction between the underside of the diaphragm and the nozzle abuts the lower part 59 of the pillar. Thus, in this position, no product can escape.

Referring now to Figure 2, in the situation where the closure is fixed to a squeeze-bottle and inverted, when the bottle is squeezed, the internal pressure increases and the liquid product flows through the body of the inner part to impinge on the diaphragm. The diaphragm is therefore caused to flex and lifts the nozzle off the pillar. Product is thus able to flow out through the nozzle and exit hole via the space so created between the nozzle and pillar. The nozzle has an inwardly-pointed rim 65 as an anti-drip measure.

As shown in Figure 3, squeezing the bottle harder will result in an increased pressure which flexes the diaphragm even more. As a result, the nozzle is lifted even further from the pillar, so increasing the gap between nozzle and pillar and so increasing the dispensing rate of the product.

The present invention is not to be construed as limited by the aforementioned description of a preferred embodiment and in the light of this disclosure, modifications of the preferred embodiment and other embodiments, all within the scope of the invention as herein before defined will now become apparent to persons skilled in the art.

CLAIMS

1. A dispensing closure for a container, the closure comprising a flexible diaphragm having an opening leading into a nozzle contiguous with the diaphragm, the closure further comprising a pillar arranged to cooperate with the nozzle such that pressure applied to contents in the container causes the diaphragm to flex to move the nozzle out of contact with the pillar thus allowing contents to exit through the nozzle.
2. A closure according to claim 1, wherein the pillar is tapered so that in the closed position, the lower rim defined between the lower end of the nozzle and the diaphragm opening is urged down onto the tapered periphery to effect a seal.
3. A closure according to claim 1, wherein the pillar is provided with a shoulder for said rim to bear down upon, to make the seal when in the closed position.
4. A closure according to any preceding claim, wherein the nozzle is tapered.
5. A closure according to claim 2 or claim 4, wherein the taper on the pillar and/or on the nozzle, as appropriate, is such that the diameter reduces in an upward direction, away from the container in the direction in which product is to be dispensed.
6. A closure according to any preceding claim, wherein the pillar comprises two parts, both tapered each with the lower part generally having a wider diameter than the upper part.
7. A closure according to any preceding claim, which

closure comprises an outer part provided with the diaphragm and nozzle and an inner part provided with the pillar.

8. A closure according to claim 7, wherein the outer and inner parts are connected together by mutual interference fit.

9. A closure according to claim 7, wherein the outer and inner parts are connected together by a screw-thread arrangement.

10. A closure according to any of claims 7-9, wherein the outer part is provided with means enabling attachment to a container such as a squeeze bottle.

11. A closure according to any preceding claim, also provided with a longitudinal notch or score to aid venting.

12. A closure according to any preceding claim, also provided with a lock-down mechanism to keep the closure in a closed position during transit.

13. A closure according to any of claims 1-11, further provided with means for piercing a foil seal across the mouth of an associated container before first use.

14. A closure according to any preceding claim, also provided with a tamper-evident crimped-ring seal around the circumference of the closure.

15. A method of manufacturing a closure according to any preceding claim, the method comprising injection moulding substantially all parts of the closure including the diaphragm using any polymer or combination

of polymers suited to the intended application.

16. A dispensing closure substantially as hereinbefore described with reference to any one of the accompanying drawings.

17. A method of manufacturing a dispensing closure, the method being substantially as hereinbefore described with reference to any one of the accompanying drawings.

**Patents Act 1977**

**Examiner's report to the Comptroller under  
Section 17 (The Search Report)**

Application number  
9117009.2

**Relevant Technical fields**

- (i) UK CI (Edition K ) B8T (TWG)
- (ii) Int CL (Edition 5 ) B65D 47/04, 47/06

Search Examiner  
  
LINDA HARDEN

**Databases (see over)**

- (i) UK Patent Office
- (ii)

Date of Search  
13 JULY 1992

Documents considered relevant following a search in respect of claims

1-17

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	GB 2038788 A (R H LAUWE) See figure 1	1,2,3,7,8 9,10,11, 15
X	GB 1583494 (KENOVA) See figure 1 and page 3 lines 37-41 and 119-125	1,4-10, and 15
X	WO 82/00128 A1 (KENOVA) See figure and page 5 lines 14-32	1-10,12
X	US 4699300 (BLAKE) See figure 1	1-10

UP - doc99\F11000089

Category	Identity of document and relevant passages	Relevance to claim(s)

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